

SUPER STAR WARS SPECIAL EFFECTS



A look at what made this space saga so good

By Stuart Dollin

A LONG long time ago in a galaxy far away...the biggest box office hit of the seventies cinema was born. The film was *Star Wars*, the stars were the myriad of special effects whose sheer brilliance and breathtaking reality stunned cinema audiences world wide.

Although most people have probably heard of director George Lucas few will have heard of the likes of John Dykstra or Richard Edlund, and yet their contribution was axiomatic to the film's success.

John Dykstra, a native born Californian, was Special Photographic Effects supervisor and was instrumental in devising and shooting the many effects used in *Star Wars*. The most revolutionary of all his inventions was a motion control camera which he dubbed the Dykstraflex. Ironically, nothing in the Dykstraflex was new, but its combination of old fashioned motion control combined with computer memory gave Dykstra the very tool he needed to make *Star Wars* something special.

But what could this new system do that made it so special? Simply that you could programme the computer to manipulate a model through a series of movements and that those movements could be repeated precisely over and over again. Not only could this make the actual model movements look more realistic, but you could also relate the movements of different models to each other. When it came to filming a model fighter being shot down, you could film so far with a perfect model,

stop, fit explosive charges, produce the explosion, stop and replace the model with a crippled fighter. The finished product would all flow without any gaps in positioning. Similarly when it came to combining effects the computer made precise positioning of each element simplicity itself.

The most spectacular parts of *Star Wars* were the various views of space ships as well as the aerial dog-fights. How were they realised? Of course the space ships were models but how do you make them appear to fly through space?

Surprisingly the technique is almost as old as the cinema itself and known as matteing. Take a simple scene of the Millenium Falcon flying through space. There are two elements involved – the Falcon and the background of the stars. The Falcon will be a model, the background a painting. The spaceship would be shot against a blue background. A matte would then be produced which is basically an outline of the spaceship image with everything that wasn't blue coming out as black. This outline or silhouette is then super-imposed over the background and finally the image of the spaceship is superimposed on top of this. Sounds simple – but there are problems.

The principle one is called blue spill. The whole system of matteing depends on the fact that anything blue on the super-imposed image will not appear on the final image. Going back to our space-ship example, if the Millenium Falcon shot has been lit so that some blue light falls on the space-ship itself, then those patches of blue light, or spill, will appear as holes in the space ship when the final composite image is produced. The second problem occurs when the matte and the two images don't exactly fit. Then you get lines around everything, a failing that has shown up with monotonous regularity in many movies. So why use blue screen and mattes at all?

There's nothing wrong with the system according to John Dykstra, but rather the way the thing is carried out. "It rarely gets done properly because it's usually done by a dozen different people", he says. "Each person has a different concept of how it works or doesn't really care".

But the special effects problems don't end there. Before you can even think about combining models and backgrounds, you have to make the models look real, a particular problem with miniature photography. As Richard Edlund, Effects Cameraman explains, "You can't have anything that goes out of focus. That's the prime rule. Anything that goes out of focus is a dead give away."

This problem of focus really determined how big the final models were going to be. Too small and they had focus difficulties, too large and the models would become unwieldy.

In the initial stages Dykstra and Edlund were working very much on their own with little or no storyboarding. George Lucas was in England shooting the 'acting' bits of the film while the special effects team were back in California busy working from a few ideas and some world war II film that Lucas had been using to show how his dog-fight scenes should be scripted. A lot of that early footage was in fact never used although once Lucas returned to LA he was very specific in what he wanted and there was little wastage.

One particular form of special effect that received little attention in *Star Wars* but was to become much more important in its sequel *The Empire Strikes Back*, was that of stop motion animation. Anyone who has ever seen a Ray Harryhausen movie (and there are plenty available on video including his latest, *Clash of the Titans*) will be familiar with the possibilities and drawbacks of the technique.

Jon Berg and Phil Tippett were originally employed by Lucas to design and sculpt (!) the makeups for the cantina scene (that's the bar on the planet where Luke and Obe Wan Kenobi meet Han Solo). At the same time they were also working on the chess-board sequence which takes place while the rebels are fleeing from Luke's home planet.

If the chess game in *Star Wars* was a fluke – an extension on the ideas used for creatures in the cantina scene – the use of stop motion animation in *The Empire Strikes Back* was crucial. Both the tauntauns (the creature which was ridden by Luke) and the Empire snow walkers were stop motion creations, the walkers more by accident, the tauntauns by design.

Originally Lucas wanted to use ex Norwegian army tanks but a chance look at a promotional brochure for US Steel changed all that. This sixties publication called 'what steel will be used for in the future' contained a whole host of drawings by Syd Meade, one of which was a four legged walking truck. There was no going back.

The next problem was finding a way to animate the model so that it looked real and for this designer Joe Johnston turned to the animators bible – Eadweard Muybridge's Animals in motion. Eventually the humble elephant was selected to give reference for the animators.

Altogether three eighteen inch high models were built and the prototype took around three months to construct. These were supplemented by two four foot models used in two shots.

Denis Muren, by now promoted to supervisor of special effects, started figuring out how he would do the walker and tauntaun shots in July 1979. The key fact was to make the sets fit for as many different shots as possible. "That was a process that went on throughout the entire show in all departments" Tippett confirmed.

The sets themselves consisted of a clever combination of baking soda in the foreground as a snow substitute with painted backgrounds. Although up to five or six walkers can be seen in shot only the front three were ever real models. The rest were photographic cut-outs. Because this was stop motion photography it meant that the positions of the models needed to be changed every frame and it was particularly difficult to get at the models without leaving giant size foot prints all over the 'snow'. The problem was largely solved by building a trapdoor into the floor of the set, cleverly gluing down the soda

Luke and Chewbacca in the Millenium Falcon — looking at a blue screen.



move when the door was opened and making sure that the edges were well disguised. And it was time consuming – a typical four to six second shot in the final product could take up to six hours to actually complete in the studio.

One concession to the video age was made in the use of a Lyon-Lamb video animation system to check animation sequences. Essentially a video frame store, the crew were able to put each of their stop motion frames into the system and run them immediately. Not only did Tippett and Berg not have to wait for rushes to see if what they were shooting was OK, but they could also make corrections as they went along.

A sense of flowing movement was not necessary for the snow walkers – a mechanical jerkiness was in fact a positive bonus. Not so the tauntauns. These were meant to be living creatures and as such posed problems all of their own.

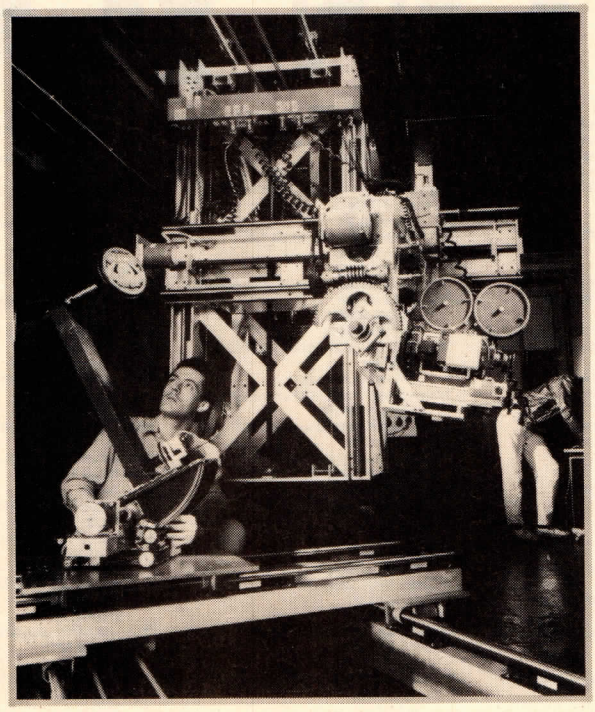
Originally it has been suggested that they use a man dressed up in an animal suit but Lucas soon changed his mind when Phil Tippett showed him a model he had the final result was something looking like a cross between a llama and a kangaroo initial suggestions ranged through frogs, fleas and a multitude of hybrid creatures. In the meantime the film crew in England who were doing the action filming were wanting to know what he final creature looked like so that they could build a full size replica to incorporate into the live shots. At this stage the script was still being modified.

This full size model had its limitations as Denis Muren explained. "I thought it looked pretty dead. They sort of goofed on the eyes. Still it was a very difficult job and they were very rushed on it." In the end it cut into the animated sequences very well.

In all there were a dozen tauntaun sequences in the film. The most difficult of which were those against a blue background. "It's very difficult to animate in a blue-screen situation" said Muren because there isn't much relational material to look at. It's hard to look through the camera and get the feeling of what you're doing."

Not that *The Empire Strikes Back* is a movie that majors on stop motion

Motion control rig at the Moving Picture Company — more versatile than the Dykstraflex?



source of special effects. Lest one forgets, many of the spectacular city scapes in Empire are the work of Ralph McQuarrie. They formed the background for many of the shots and incorporated as background mattes as explained earlier. It might also be worth mentioning that Alec Guinness didn't really risk life and limb creeping around the central core in the Death Star in *Star Wars*. He was a matter of 3 or 4 feet up and the rest was a background painting matted in the usual way.

So what of the future? From the start the team set up to produce special effects for Lucas – Industrial Light and Magic – has been seeking to expand the frontiers of special effects. The Dykstraflex camera, although not a brand new technology, did bring together many different elements to make something new, while the techniques of stop motion photography were polished and improved for *Empire Strikes Back.*

Now Lucas has set a computer research group called Sprocket Systems whose brief is to look into all aspects of computers and film making, but at the same time is not connected with any specific film project. According to Lucas, much of the equipment and techniques used in conventional film making is significantly behind the times. The only way to get round this he adds is to develop the tools himself. perhaps the most exciting of all research options is the computer graphics. The ice has already been broken with *Tron* – and Lucas appears to be working towards computer animation in the next Star Wars film.

There is the possibility of producing an entire film within the computer and the only draw back at the moment is that of speed. To produce a single frame of solid surface graphics (that is properly filled in objects instead of just wire frameworks) can take literally hours. But the possibilities are endless. One person in the group has perfected a terrain 50 miles square while another creates an image of a plant which 'grows' in an organic way.

The technique is already being used in TV in this country and one company in particular, The Moving Picture Company, is an expert both in this and other special effects techniques. They even own a motion control rig that is more versatile even than the Dykstraflex!

Producer Kim Remick explained how they were able to produce computer animated images. "Very simple. First of all you need a drawing of what you are going to animate. You put it on the plotting tablet and place the computer cursor on the key points around the image. Then press a button and you should have the image in the computer. It will join up the dots and give you a wire picture.

This can then be manipulated within the computer — moved around, upside down, stretched, squashed and so on — and be assigned all sorts of colours. Once an animation sequence has been worked out it can be programmed into the computer and this will then write the image directly onto film using a fibre optic light source."

Another of Sprocket System's areas of research is also particularly interesting for several reasons. Ralph Guggenheim is the director of this project and his line of research is using video as an editing aid. He envisages transferring raw film stock onto video disc, each with its own frame number.

With several disc players linked to computer controlled desk, the operator can assemble an edit using the computer which will then play the complete film calling up frames from the various discs.

George Lucas then is not a man to fall behind the times. Some of the developments that have come up specifically to solve problems on his movies have set trends and established techniques for others to follow. Others, will never be actually seen on screen yet make what is seen on screen possible.